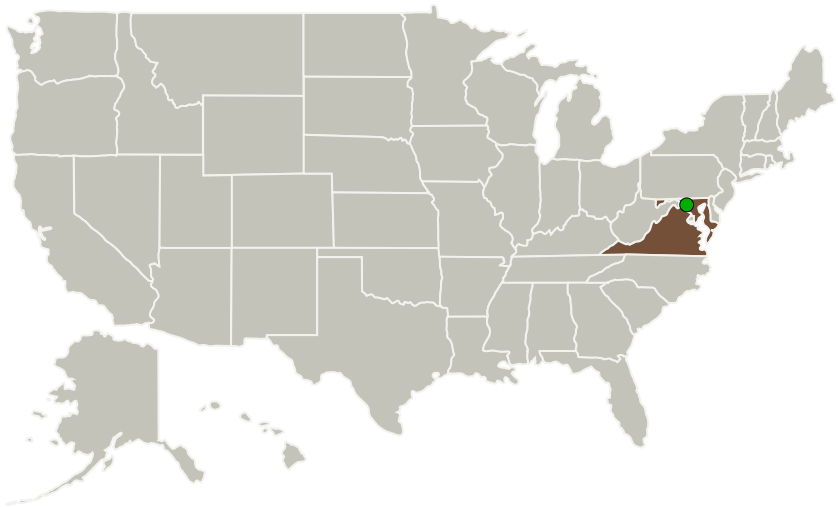
# Measuring Low Fluxes of Photons, Neutral Molecules and Ions with a New Generation of Detectors, Phase I

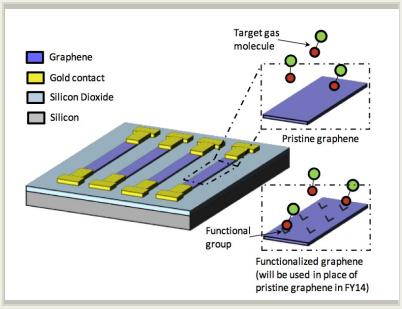
Completed Technology Project (2013 - 2013)

## Project Introduction

A new detector evaluation method (DEM) is proposed to determine the response of graphene detectors to low fluxes of photons, neutral atoms/molecules, and ions in the space environment of high to ultra-high vacuum. The method, aimed mainly at evaluation for space applications of new graphene detectors, is also applicable to other detectors operating in non-space environments. DEM will test graphene response to very low fluxes of atoms and molecules, ions, and photons; if sensitive to extremely low fluxes of a few 100/s, the timing of pulses produced by bunched events may open up an entirely new avenue to time-of-flight mass spectrometry. Closely coordinating with the NASA GSFC Detector Systems Branch, DEM will characterize the detector response to enable low-cost demonstrations of ionosphere-thermosphere investigations in low-Earth-orbit in CubeSats and sounding rockets. Space-borne measurements require knowledge of the response to the three kinds of particles: photons, ions, and neutrals, to properly design experiments. DEM controls vacuum pressure at the detector and can validate the application of these new detectors to a new series of mass spectrometers that can operate over a broad range of vacuum pressures (0.1 milliTorr and lower) because of their small size – DEM will add value to cost effective NASA balloon, sounding rocket, and satellite investigations.

## Primary U.S. Work Locations and Key Partners



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## Table of Contents

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| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| Space Systems Research Corporation | Lead Organization | Industry<br>Women-Owned Small Business (WOSB) | Alexandria, Virginia |
| Goddard Space Flight Center(GSFC) | Supporting Organization | NASA Center | Greenbelt, Maryland |

| Primary U.S. Work Locations | |
|---|---|
| Maryland | Virginia |

## Project Transitions

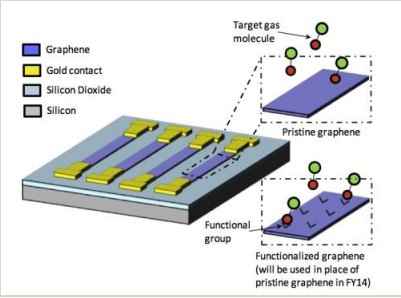
**May 2013:** Project Start

**November 2013:** Closed out

**Closeout Documentation:**

- Final Summary Chart*(https://techport.nasa.gov/file/138291)*

## Images




**Project Image**
Measuring Low Fluxes of Photons, Neutral Molecules and Ions with a New Generation of Detectors *(https://techport.nasa.gov/image/127586)*

## Organizational Responsibility

**Responsible Mission Directorate:**
Space Technology Mission Directorate (STMD)

**Lead Organization:**
Space Systems Research Corporation

**Responsible Program:**
Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**
Jason L Kessler

**Program Manager:**
Carlos Torrez

**Principal Investigator:**
Federico Herrero

**Co-Investigator:**
Federico A Herrero

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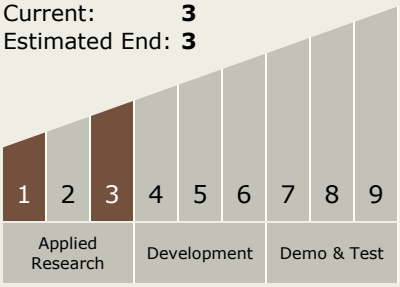
## Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**




## Technology Areas

**Primary:**

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.4 Environment Sensors

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System